UCRL-JC-119269 ABS

Compounds Produced by Motor Burnouts of Refrigeration Systems

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Compounds produced during the burnout of motors which use hydrochlorofluorocarbons and hydrofluorocarbons refrigerants are potentially harmful to human health. These compounds must be indentified so that their health risks can be assessed. We have simulated motor burnout conditions with a custom-built apparatus which sends hundreds of thousands of electrical arcs (25 microsecond duration and 80V) through a selected refrigerant contained in a test cell. The compounds produced by this process were identified by electron ionization, gas chromatography-mass spectrometry. The refrigerants R-22 (chlorodifluoromethane), R-134a (1,1,1,2-tetrafluoroethane), and AZ-50 (pentafluoroethane and 1,1,1-trifluoroethane mixture) were subjected to arcing conditions at both ambient and elevated pressures (200 psi) and temperatures (200C). In addition, compounds produced during controlled motor burnouts were identified. Chlorinated and fluorinated hydrocarbons of larger molecular weights than the starting materials were the major compounds identified and were present at concentrations of 100 ppm to 30 ppt (wt/wt).

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract W-7405-ENG-48.